



# SGM5018

## 4.5Ω, High Speed, Low Voltage Quad, SPDT Analog Switch

### GENERAL DESCRIPTION

The SGM5018 is a high-speed, low voltage, quad single-pole/double-throw (SPDT) CMOS analog switch that is designed to operate from a single +1.8V to +5.5V power supply.

SGM5018 features guaranteed on-resistance (4.5Ω TYP), on-resistance matching (3.6Ω MAX) between switches and guaranteed on-resistance flatness over the signal range (3Ω TYP). This ensures excellent linearity and low distortion when switching audio signals. Fast switching speed, coupled with high signal bandwidth (300MHz), also makes the parts suitable for video signal switching. CMOS process ensures ultra low power dissipation, making the parts ideally suited for portable and battery powered instruments.

SGM5018 is available in Green TSSOP-16 package.

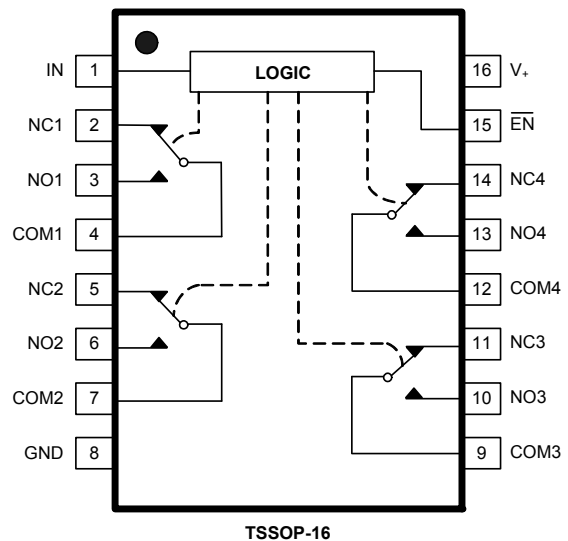
### APPLICATIONS

- Battery-Powered Systems
- USB 1.1 Signal Switching Circuits
- Communication Systems
- Portable Instrumentation
- Audio and Video Switching
- Computer Peripherals
- Cell Phones
- PDA's

### FEATURES

- Low Voltage Operation: 1.8V to 5.5V
- $R_{ON}$  is Typically 4.5Ω at 5V
- Low On-Resistance Flatness
- -3dB Bandwidth: 300MHz
- Rail-to-Rail Input and Output Operation
- Typical Power Consumption (< 0.01μW)
- TTL/CMOS Compatible
- -40°C to +85°C Operating Temperature Range
- Available in Green TSSOP-16 Package

### PIN CONFIGURATION (TOP VIEW)



### FUNCTION TABLE

| $\overline{EN}$ | IN | NO                | NC  |
|-----------------|----|-------------------|-----|
| L               | L  | OFF               | ON  |
| L               | H  | ON                | OFF |
| H               | √  | All Switches Open |     |

√ = Don't Care.

**PACKAGE/ORDERING INFORMATION**

| MODEL   | PIN-PACKAGE | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKAGE OPTION      |
|---------|-------------|-----------------------------|-----------------|-----------------|---------------------|
| SGM5018 | TSSOP-16    | -40°C to +85°C              | SGM5018YTS/TR   | SGM5018YTS      | Tape and Reel, 3000 |

**ABSOLUTE MAXIMUM RATINGS**

|  |                                   |  |                 |
|--|-----------------------------------|--|-----------------|
| V <sub>+</sub> to GND.....                         | -0.3V to 6V                       | Storage Temperature Range.....         | -65°C to +150°C |
| Analog, Digital voltage range <sup>(1)</sup> ..... | -0.3V to (V <sub>+</sub> ) + 0.3V | Lead Temperature (soldering, 10s)..... | 260°C           |
| Continuous Current NO, NC, or COM.....             | ±100mA                            | ESD Susceptibility                     |                 |
| Operating Temperature Range.....                   | -40°C to +85°C                    | HBM.....                               | 4000V           |
| Junction Temperature.....                          | 150°C                             | MM.....                                | 400V            |

**NOTES:**

1. Signals on NC, NO, or COM or IN<sub>x</sub> exceeding V<sub>+</sub> will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
2. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**CAUTION**

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

**PIN DESCRIPTION**

| NAME                   | PIN          | FUNCTION  |
|------------------------|--------------|---|
| V <sub>+</sub>         | 16           | Power Supply.   |
| GND                    | 8            | Ground.   |
| IN                     | 1            | Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.                  |
| $\overline{\text{EN}}$ | 15           | Digital Enable Input. Normally connect to GND. Drive to logic high to set all switches off. |
| COM <sub>x</sub>       | 4, 7, 9, 12  | Common Terminal.  |
| NO <sub>x</sub>        | 3, 6, 10, 13 | Normally-Open Terminal.   |
| NC <sub>x</sub>        | 2, 5, 11, 14 | Normally-Closed Terminal.   |

NOTE: NO<sub>x</sub>, NC<sub>x</sub> and COM<sub>x</sub> terminals may be an input or output.

**ELECTRICAL CHARACTERISTICS**

( $V_+ = +4.5V$  to  $+5.5V$ ,  $GND = 0V$ ,  $V_{IH} = +1.6V$ ,  $V_{IL} = +0.5V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ . Typical values are at  $V_+ = +5.0V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

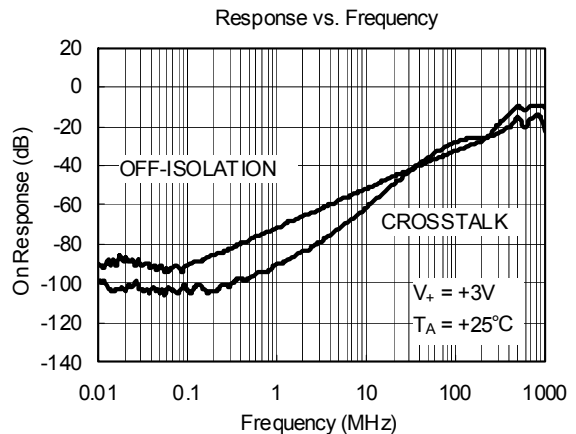
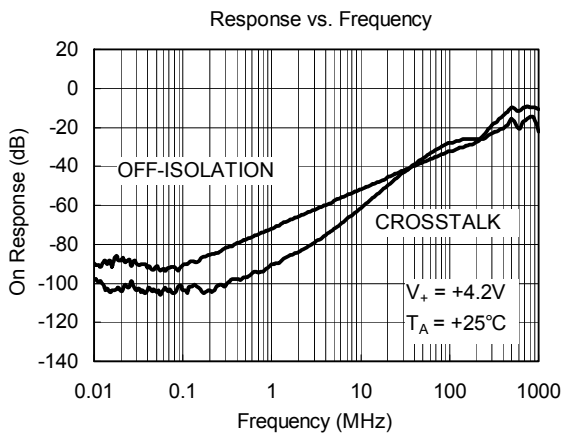
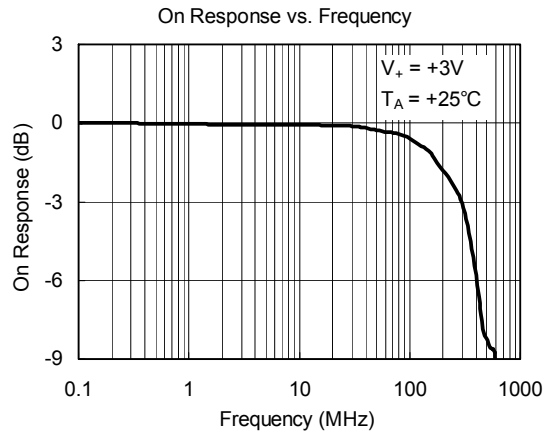
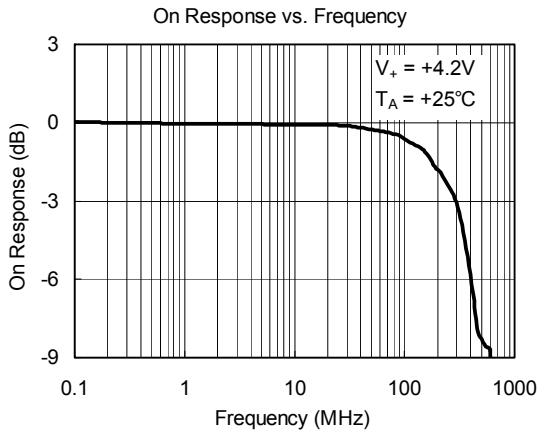
| PARAMETER                                      | SYMBOL                                     | CONDITIONS  | TEMP                           | MIN           | TYP | MAX   | UNITS    |
|--|--|---|--------------------------------|---------------|-----|-------|----------|
| <b>ANALOG SWITCH</b>                           |  |   |                                |               |     |       |          |
| Analog Signal Range                            | $V_{NO}, V_{NC}, V_{COM}$                  |   | $-40^\circ C$ to $+85^\circ C$ | 0             |     | $V_+$ | V        |
| On-Resistance                                  | $R_{ON}$                                   | $V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$<br>$I_{COM} = -100mA$ , Test Circuit 1       | $+25^\circ C$                  |               | 4.5 | 7     | $\Omega$ |
|  |  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 8     | $\Omega$ |
| On-Resistance Match<br>Between Channels        | $\Delta R_{ON}$                            | $V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V,$<br>$I_{COM} = -100mA$ , Test Circuit 1       | $+25^\circ C$                  |               | 0.8 | 3.6   | $\Omega$ |
|  |  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 4.2   | $\Omega$ |
| On-Resistance<br>Flatness                      | $R_{FLAT(ON)}$                             | $V_+ = 4.5V, V_{NO}$ or $V_{NC} = 1.2V, 4.5V,$<br>$I_{COM} = -100mA$ , Test Circuit 1 | $+25^\circ C$                  |               | 3   | 3.7   | $\Omega$ |
|  |  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 4.5   | $\Omega$ |
| Source OFF Leakage<br>Current                  | $I_{NC(OFF)}, I_{NO(OFF)}$                 | $V_+ = 5.5V, V_{NO}$ or $V_{NC} = 3.3V/0.3V,$<br>$V_{COM} = 0.3V/3.3V$                | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |
| Channel ON Leakage<br>Current                  | $I_{NC(ON)}, I_{NO(ON)},$<br>$I_{COM(ON)}$ | $V_+ = 5.5V, V_{COM} = 0.3V/3.3V,$<br>$V_{NO}$ or $V_{NC} = 0.3V/3.3V$ , or floating  | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |
| <b>DIGITAL INPUTS</b>                          |  |   |                                |               |     |       |          |
| Input High Voltage                             | $V_{INH}$                                  |   | $-40^\circ C$ to $+85^\circ C$ | 1.6           |     |       | V        |
| Input Low Voltage                              | $V_{INL}$                                  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 0.5   | V        |
| Input Leakage Current                          | $I_{IN}$                                   | $V_+ = 5.5V, V_{IN} = 0V$ or $5.5V$   | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |
| <b>DYNAMIC CHARACTERISTICS</b>                 |  |   |                                |               |     |       |          |
| Turn-On Time                                   | $t_{ON}$                                   | $V_{NO}$ or $V_{NC} = 2V, C_L = 35pF,$<br>$R_L = 300\Omega$ , Test Circuit2           | $+25^\circ C$                  |               | 40  |       | ns       |
| Turn-Off Time                                  | $t_{OFF}$                                  |   | $+25^\circ C$                  |               | 30  |       | ns       |
| Break-Before-Make<br>Time Delay                | $t_D$                                      | $V_{NO}$ or $V_{NC} = 3V, R_L = 300\Omega,$<br>$C_L = 35pF$ , Test Circuit 4          | $+25^\circ C$                  |               | 18  |       | ns       |
| Off Isolation                                  | $O_{ISO}$                                  | $R_L = 50\Omega, f = 10MHz, V_{BIAS} = 350mV,$<br>Signal = 0dBm, Test Circuit5        | 1MHz                           | $+25^\circ C$ |     | -70   | dB       |
|  |  |   | 10MHz                          | $+25^\circ C$ |     | -50   | dB       |
| Channel-to-Channel<br>Crosstalk                | $X_{TALK}$                                 | $R_L = 50\Omega, f = 10MHz, V_{BIAS} = 350mV,$<br>Signal = 0dBm,, Test Circuit6       | 1MHz                           | $+25^\circ C$ |     | -90   | dB       |
|  |  |   | 10MHz                          | $+25^\circ C$ |     | -60   | dB       |
| -3dB Bandwidth                                 | BW   | $R_L = 50\Omega$ , Signal = 0dBm,<br>$V_{BIAS} = 350mV$ , Test Circuit7               | $+25^\circ C$                  |               | 300 |       | MHz      |
| Charge Injection Select<br>Input to Common I/O | Q  | $V_G = GND, R_G = 0\Omega, Q = C_L \times V_{OUT},$<br>$C_L = 1nF$ , Test Circuit3    | $+25^\circ C$                  |               | 20  |       | pC       |
| Channel ON<br>Capacitance                      | $C_{ON}$                                   |   | $+25^\circ C$                  |               | 42  |       | pF       |
| <b>POWER REQUIREMENTS</b>                      |  |   |                                |               |     |       |          |
| Power Supply Range                             | $V_+$                                      |   | $-40^\circ C$ to $+85^\circ C$ | 1.8           |     | 5.5   | V        |
| Power Supply Current                           | $I_+$                                      | $V_+ = 5.5V, V_{IN} = 0V$ or $V_+$  | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |

**ELECTRICAL CHARACTERISTICS**

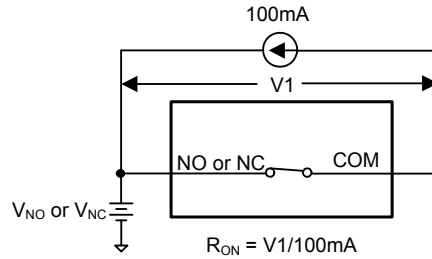
( $V_+ = +2.7V$  to  $+3.6V$ ,  $V_{IH} = +1.6V$ ,  $V_{IL} = +0.4V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ . Typical values are at  $V_+ = +3.0V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

| PARAMETER   | SYMBOL                                     | CONDITIONS  | TEMP                           | MIN           | TYP | MAX   | UNITS    |
|---|--|---|--------------------------------|---------------|-----|-------|----------|
| <b>ANALOG SWITCH</b>                              |  |   |                                |               |     |       |          |
| Analog Signal Range                               | $V_{NO}, V_{NC}, V_{COM}$                  |   | $-40^\circ C$ to $+85^\circ C$ | 0             |     | $V_+$ | V        |
| On-Resistance                                     | $R_{ON}$                                   | $V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.2V$ ,<br>$I_{COM} = -100mA$ , Test Circuit 1       | $+25^\circ C$                  |               | 11  | 15.5  | $\Omega$ |
|   |  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 18.5  | $\Omega$ |
| On-Resistance Match<br>Between Channels           | $\Delta R_{ON}$                            | $V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.2V$ ,<br>$I_{COM} = -100mA$ , Test Circuit 1       | $+25^\circ C$                  |               | 1.6 | 4     | $\Omega$ |
|   |  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 4.6   | $\Omega$ |
| On-Resistance<br>Flatness                         | $R_{FLAT(ON)}$                             | $V_+ = 2.7V$ , $V_{NO}$ or $V_{NC} = 1.2V, 4.5V$ ,<br>$I_{COM} = -100mA$ , Test Circuit 1 | $+25^\circ C$                  |               | 7   | 9.4   | $\Omega$ |
|   |  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 13    | $\Omega$ |
| Source OFF Leakage<br>Current                     | $I_{NC(OFF)}, I_{NO(OFF)}$                 | $V_+ = 3.6V$ , $V_{NO}$ or $V_{NC} = 3.3V/0.3V$ ,<br>$V_{COM} = 0.3V/3.3V$                | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |
| Channel ON Leakage<br>Current                     | $I_{NC(ON)}, I_{NO(ON)},$<br>$I_{COM(ON)}$ | $V_+ = 3.6V$ , $V_{COM} = 0.3V/3.3V$ ,<br>$V_{NO}$ or $V_{NC} = 0.3V/3.3V$ , or floating  | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |
| <b>DIGITAL INPUTS</b>                             |  |   |                                |               |     |       |          |
| Input High Voltage                                | $V_{INH}$                                  |   | $-40^\circ C$ to $+85^\circ C$ | 1.5           |     |       | V        |
| Input Low Voltage                                 | $V_{INL}$                                  |   | $-40^\circ C$ to $+85^\circ C$ |               |     | 0.4   | V        |
| Input Leakage Current                             | $I_{IN}$                                   | $V_+ = 5.5V$ , $V_{IN} = 0V$ or $3.6V$  | $-40^\circ C$ to $+85^\circ C$ |               |     | 1     | $\mu A$  |
| <b>DYNAMIC CHARACTERISTICS</b>                    |  |   |                                |               |     |       |          |
| Turn-On Time                                      | $t_{ON}$                                   | $V_{NO}$ or $V_{NC} = 2V$ , $C_L = 35pF$ , $R_L = 300\Omega$ ,<br>Test Circuit2           | $+25^\circ C$                  |               | 48  |       | ns       |
| Turn-Off Time                                     | $t_{OFF}$                                  |   | $+25^\circ C$                  |               | 45  |       | ns       |
| Break-Before-Make<br>Time Delay                   | $t_D$                                      | $V_{NO}$ or $V_{NC} = 2V$ , $R_L = 300\Omega$ , $C_L = 35pF$ ,<br>Test Circuit 4          | $+25^\circ C$                  |               | 20  |       | ns       |
| Off Isolation                                     | $O_{ISO}$                                  | $R_L = 50\Omega$ , $f = 10MHz$ , $V_{BIAS} = 350mV$ ,<br>Signal = 0dBm, Test Circuit5     | 1MHz                           | $+25^\circ C$ |     | -70   | dB       |
|   |  |   | 10MHz                          | $+25^\circ C$ |     | -50   | dB       |
| Channel-to-Channel<br>Crosstalk                   | $X_{TALK}$                                 | $R_L = 50\Omega$ , $f = 10MHz$ , $V_{BIAS} = 350 mV$ ,<br>Signal = 0dBm, Test Circuit6    | 1MHz                           | $+25^\circ C$ |     | -90   | dB       |
|   |  |   | 10MHz                          | $+25^\circ C$ |     | -60   | dB       |
| -3dB Bandwidth                                    | BW   | $R_L = 50\Omega$ , Signal = 0dBm,<br>$V_{BIAS} = 350mV$ , Test Circuit7                   | $+25^\circ C$                  |               | 300 |       | MHz      |
| Charge Injection<br>Select Input to<br>Common I/O | Q  | $V_G = GND$ , $R_G = 0\Omega$ , $Q = C_L \times V_{OUT}$ ,<br>$C_L = 1nF$ , Test Circuit3 | $+25^\circ C$                  |               | 20  |       | pC       |
| Channel ON<br>Capacitance                         | $C_{ON}$                                   |   | $+25^\circ C$                  |               | 42  |       | pF       |

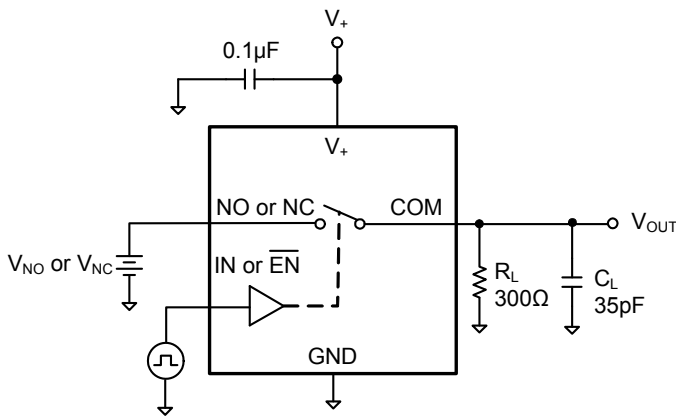
TYPICAL PERFORMANCE CHARACTERISTICS



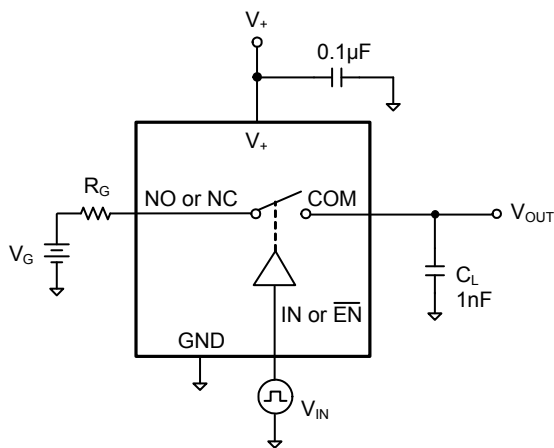
TEST CIRCUITS



Test Circuit 1. On Resistance

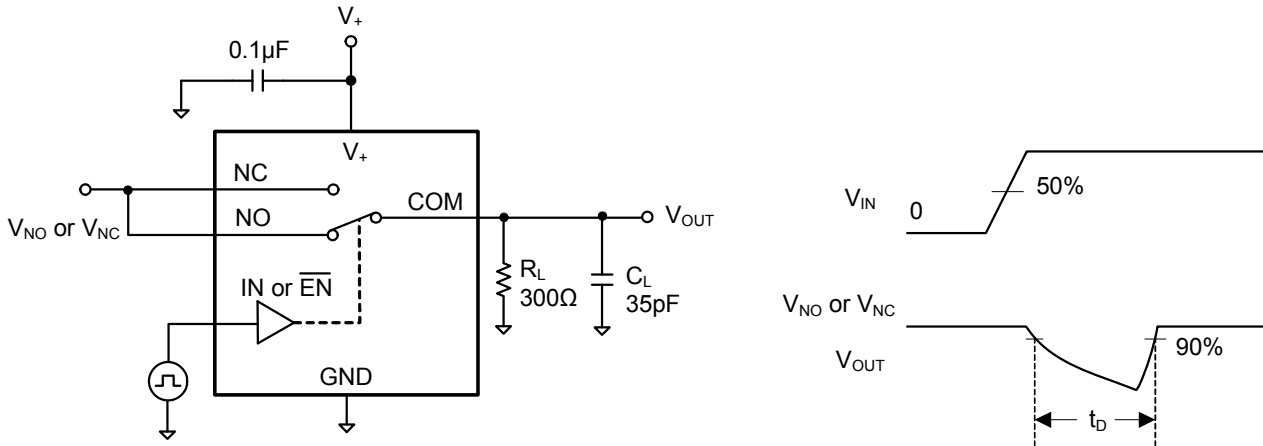


Test Circuit 2. Switching Times

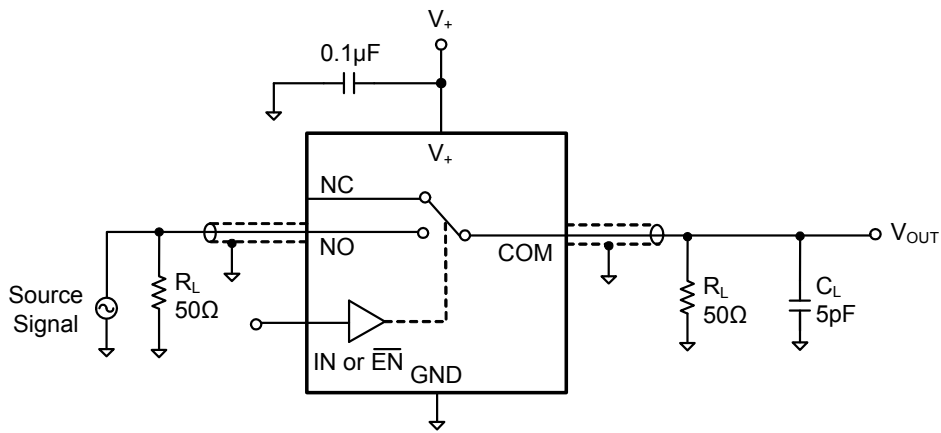


Test Circuit 3. Charge Injection

TEST CIRCUITS (Cont.)

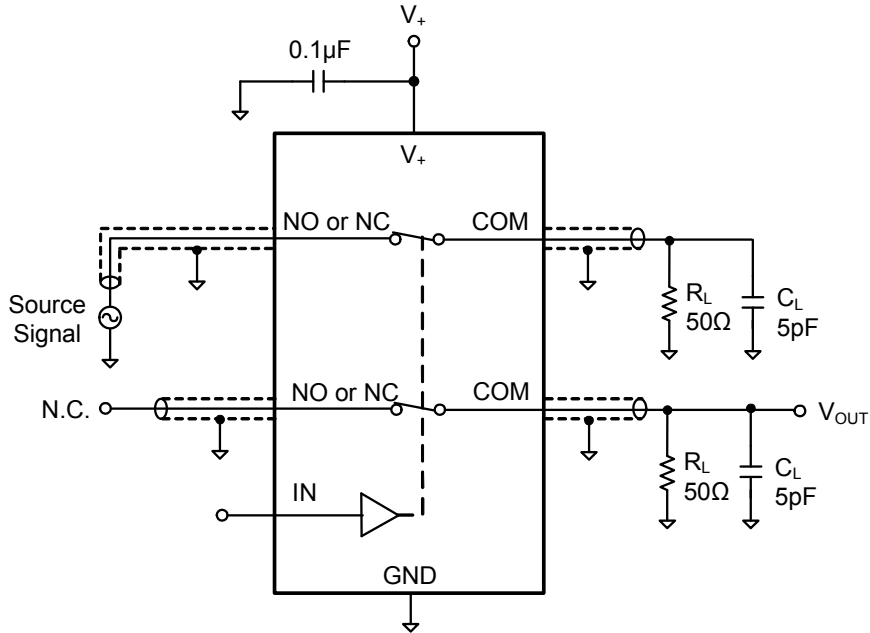


Test Circuit 4. Break-Before-Make Time Delay,  $t_d$



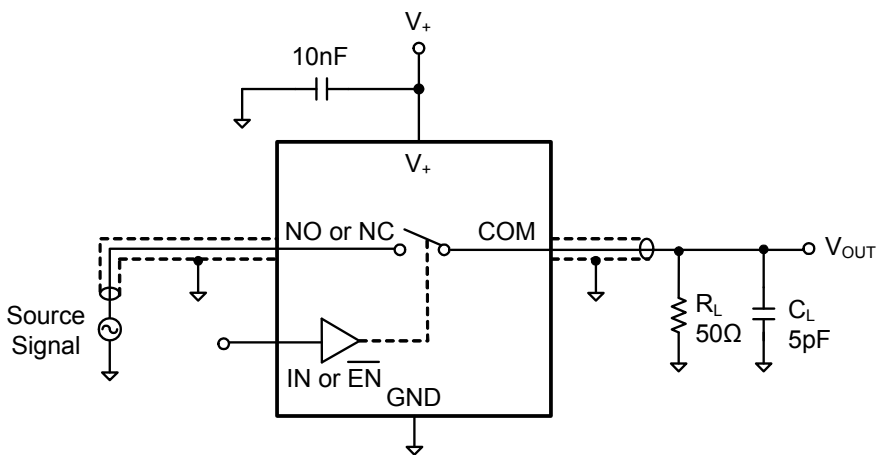
Test Circuit 5. Off Isolation

TEST CIRCUITS (Cont.)



$$\text{Channel To Channel Crosstalk} = -20 \times \log \frac{V_{\text{NO or V}_{\text{NC}}}}{V_{\text{OUT}}}$$

Test Circuit 6. Channel-to-Channel Crosstalk

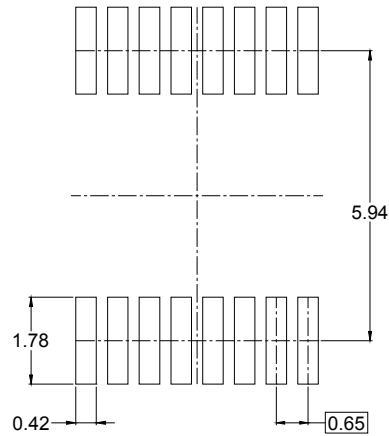
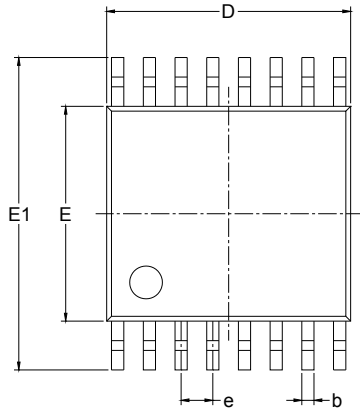


Test Circuit 7. -3dB Bandwidth

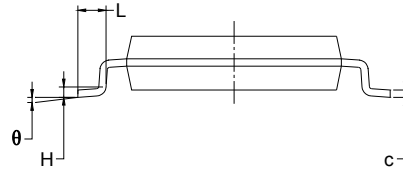
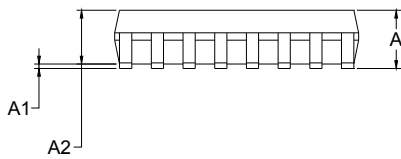


PACKAGE OUTLINE DIMENSIONS

TSSOP-16



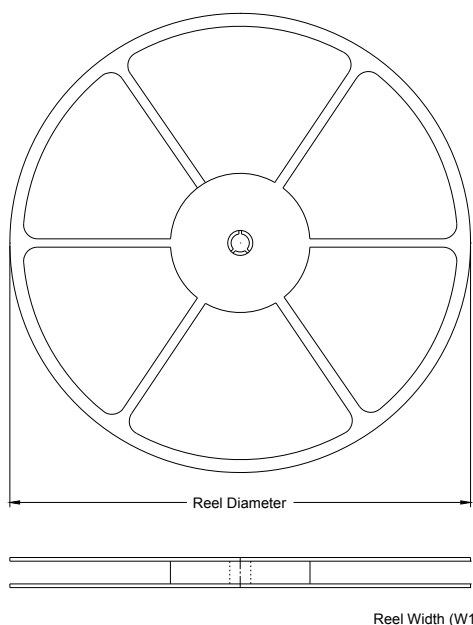
RECOMMENDED LAND PATTERN (Unit: mm)



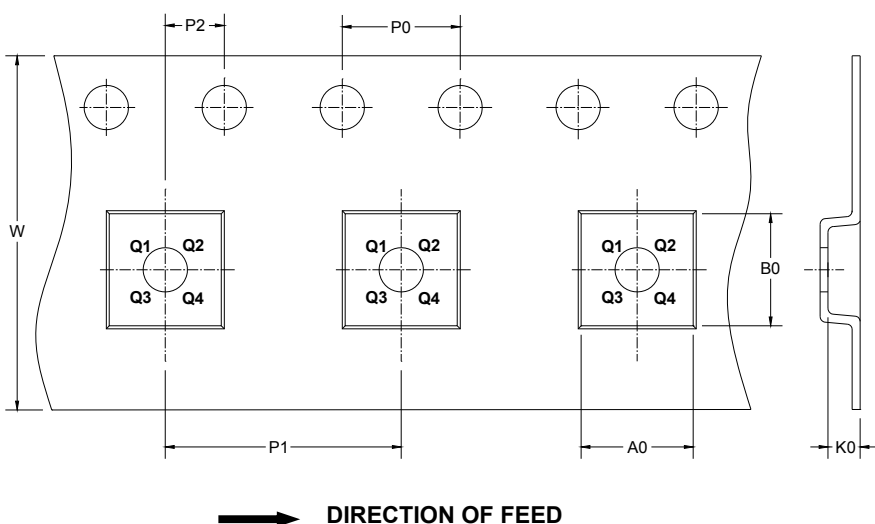
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      |                              | 1.100 |                         | 0.043 |
| A1     | 0.050                        | 0.150 | 0.002                   | 0.006 |
| A2     | 0.800                        | 1.000 | 0.031                   | 0.039 |
| b      | 0.190                        | 0.300 | 0.007                   | 0.012 |
| c      | 0.090                        | 0.200 | 0.004                   | 0.008 |
| D      | 4.900                        | 5.100 | 0.193                   | 0.201 |
| E      | 4.300                        | 4.500 | 0.169                   | 0.177 |
| E1     | 6.250                        | 6.550 | 0.246                   | 0.258 |
| e      | 0.650 BSC                    |       | 0.026 BSC               |       |
| L      | 0.500                        | 0.700 | 0.02                    | 0.028 |
| H      | 0.25 TYP                     |       | 0.01 TYP                |       |
| θ      | 1°                           | 7°    | 1°                      | 7°    |

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

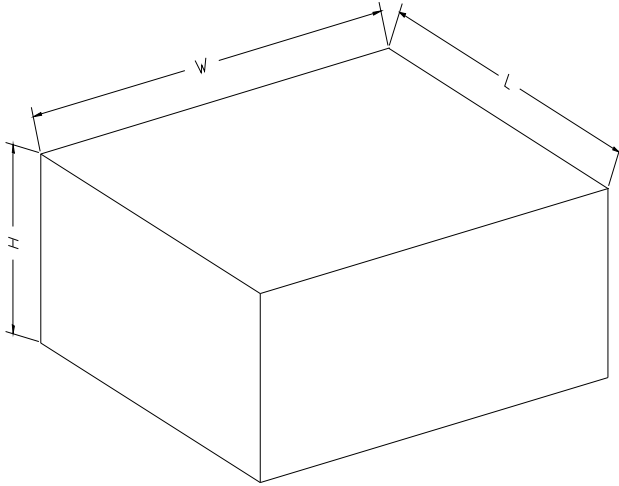
KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TSSOP-16     | 13"           | 12.4               | 6.9     | 5.6     | 1.2     | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |

# SGM5018

# 4.5Ω, High Speed, Low Voltage Quad, SPDT Analog Switch

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

| Reel Type | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-----------|-------------|------------|-------------|--------------|
| 13"       | 386         | 280        | 370         | 5            |

## X-ON Electronics

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[NLAST4599DTT1G](#) [DG403DY-T1-E3](#) [MAX4714EXTT](#) [MAX392CPE](#) [BGSX22G2A10E6327XTSA1](#) [ADG1611BRUZ-REEL7](#)